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Outstanding Student & PhD candidate Presentation contest

Groundwater sensitivity to Climate Change

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b Department of Civil Engineering, Monash University, Australia
c Climate and Energy College, University of Melbourne, Australia
d Institute of Applied Geosciences, Karlsruhe Institute of Technology, Germany
e School of Earth, Atmosphere and Environment, Monash University, Australia
f Securing Antarctica's Environmental Future, Monash University, Australia
g ARC Centre of Excellence for Climate Extremes, Monash University, Australia

Scan for abstract

THE UNIVERSITY OF MELBOURNE

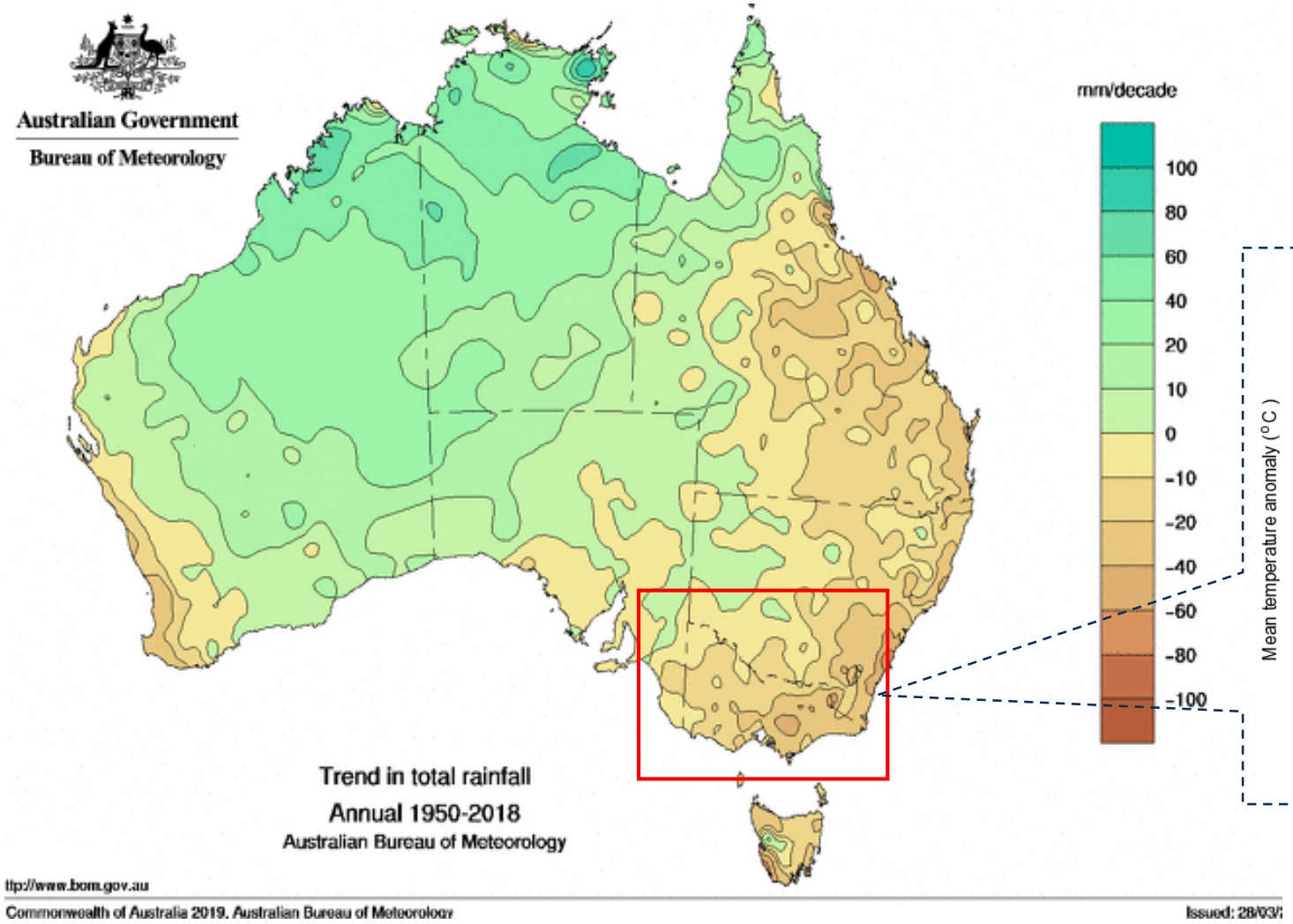
Karlsruhe Institute of Technology

MONASH University

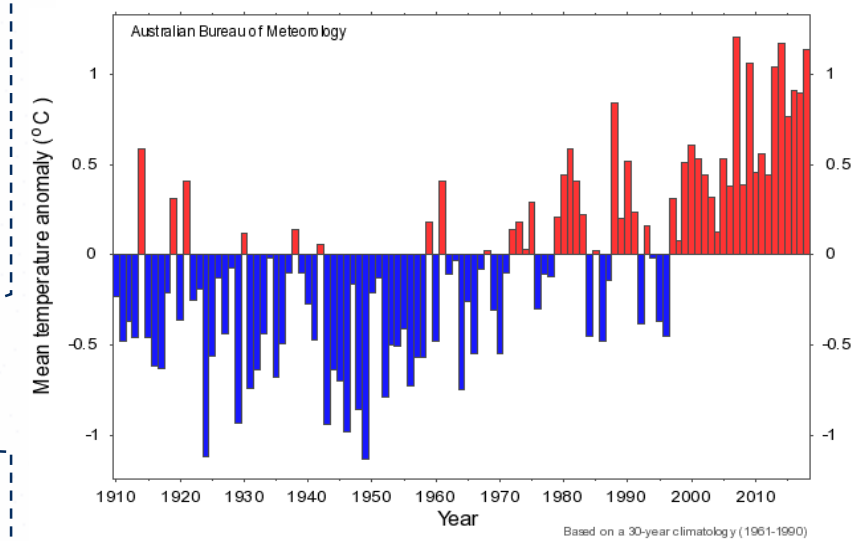
climate extremes
ARC centre of excellence

Climate trend in Australia

Rainfall trend (1950-2018)

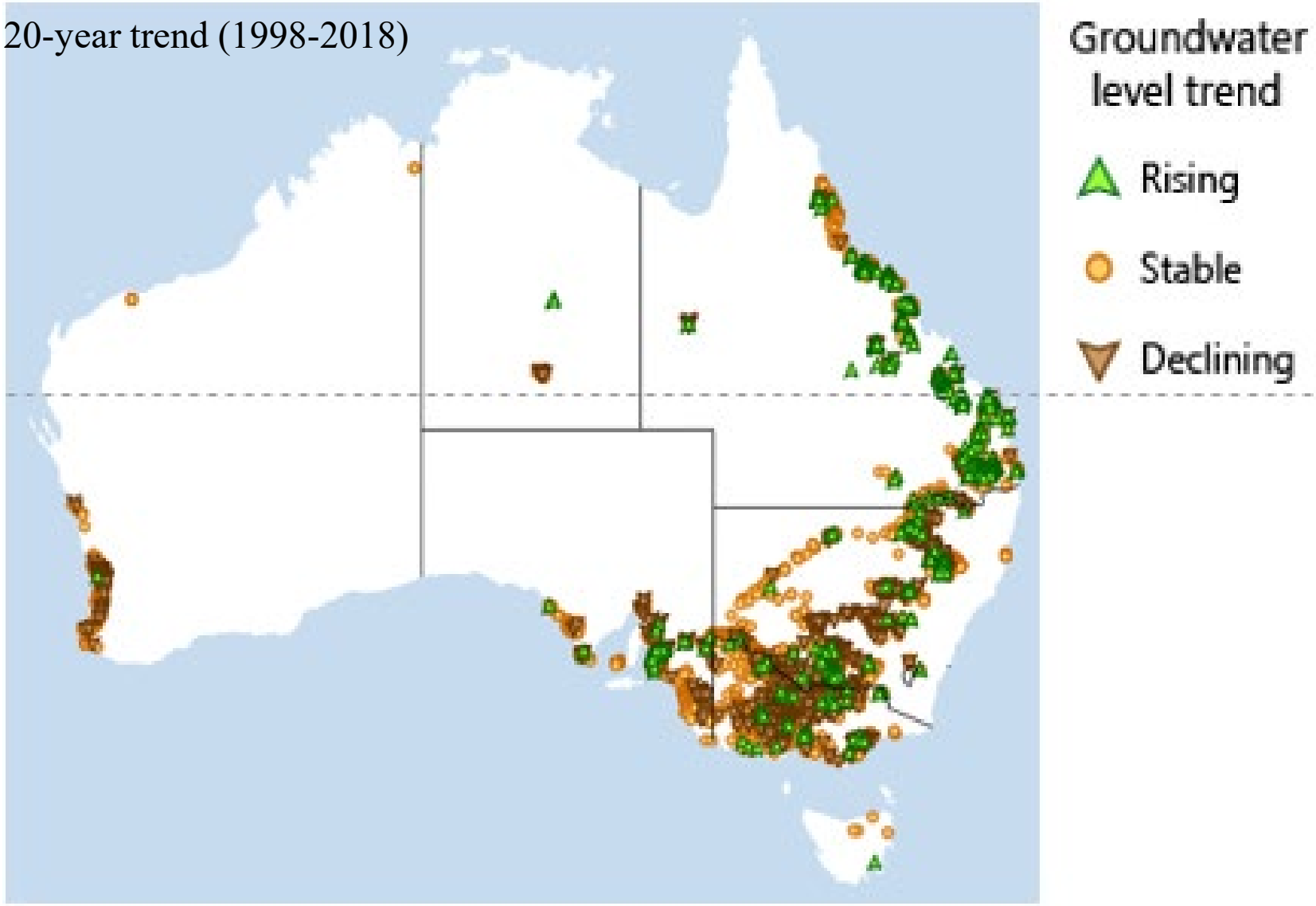


Mean T in VIC (1910-2018)



Source: http://www.bom.gov.au

83% shallow aquifers show a stable or declining trend



Source: http://www.bom.gov.au/water/groundwater/insight/#/gwtrend/summary

It is still unknown how groundwater has been impacted by climate change.

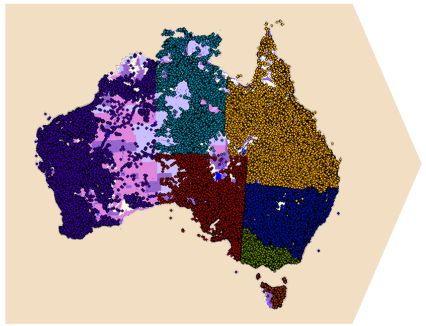
---- IPCC 5th Assessment Report (2014)

No confident assessment of groundwater projections is made here.

---- IPCC 6th Assessment Report (2021)

Methods

1. Raw data



(232,141 sites)

HydroSight groundwater time-series package: http://peterson-tim-j.github.io/HydroSight/

(Peterson, T. J. and Fulton S., 2019, Groundwater; Peterson, T. J., and Western, A. W. 2014, WRR)

Fan, et al. (in-review) Water Resources Res.

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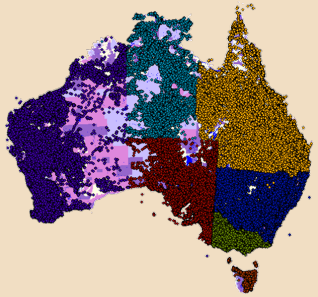

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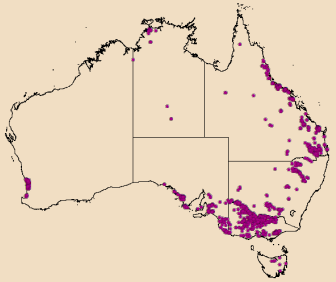
2. Preselection



- ≤ 50 m depth
- ≥ 200 observations
- include drought

(5,076 sites)

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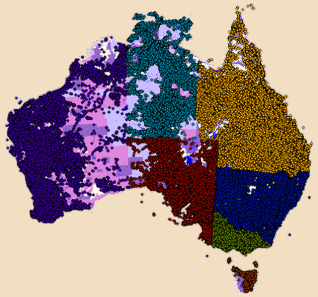

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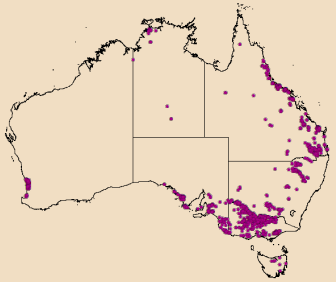

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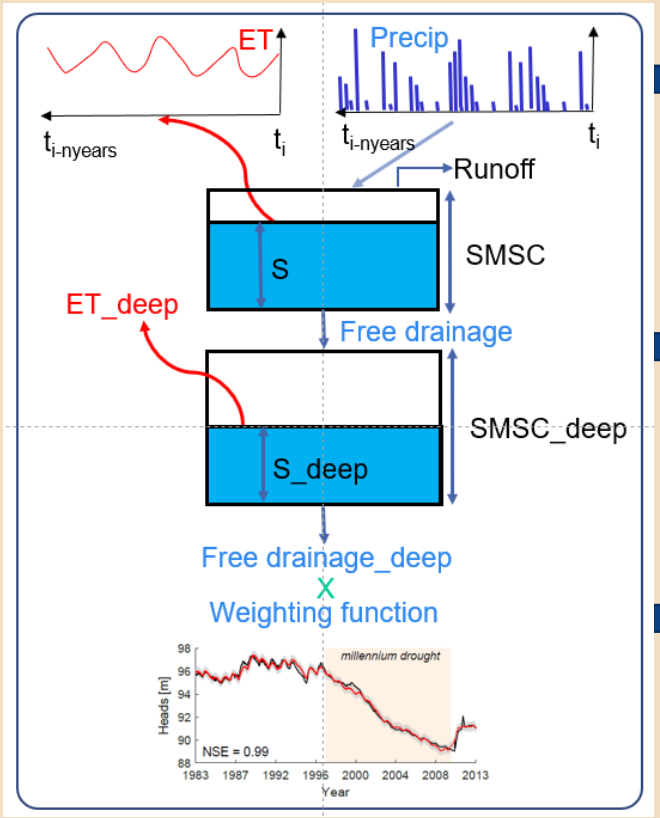

R package *AWAPer*

2-layer SMS module

Calibrated on HPC

(Photo: J. Herzog)

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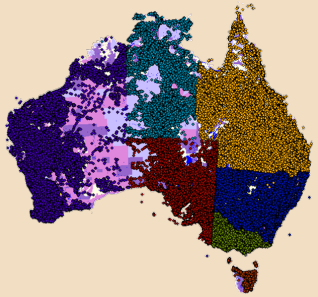

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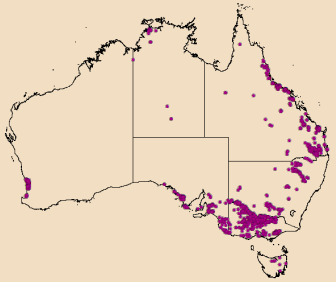

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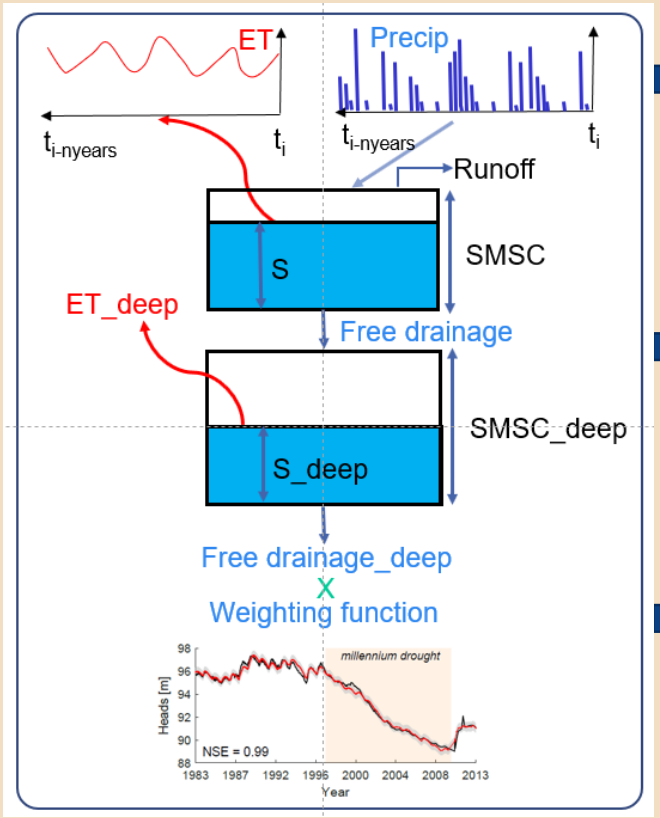

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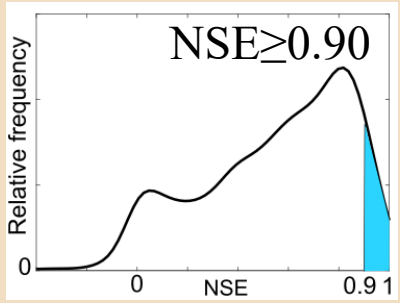
4. Climate-driven sites selection



(336 sites, ~6.6%)

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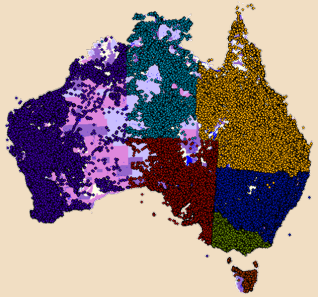

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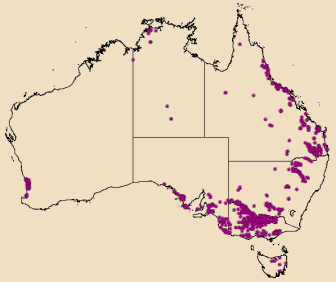

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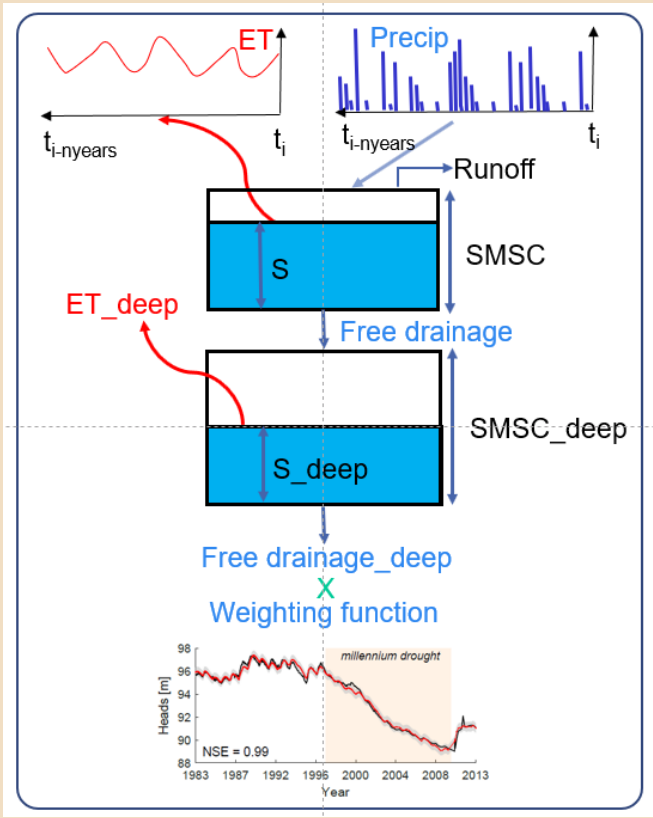

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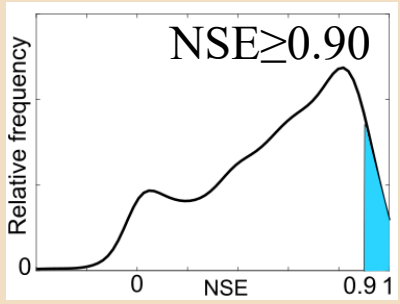

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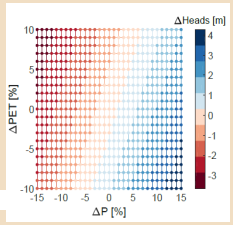
5. Sensitivity quantification



Multivariate regression

$$\delta H = \varepsilon_P \cdot \delta P + \varepsilon_{PET} \cdot \delta PET$$

(336 sites)

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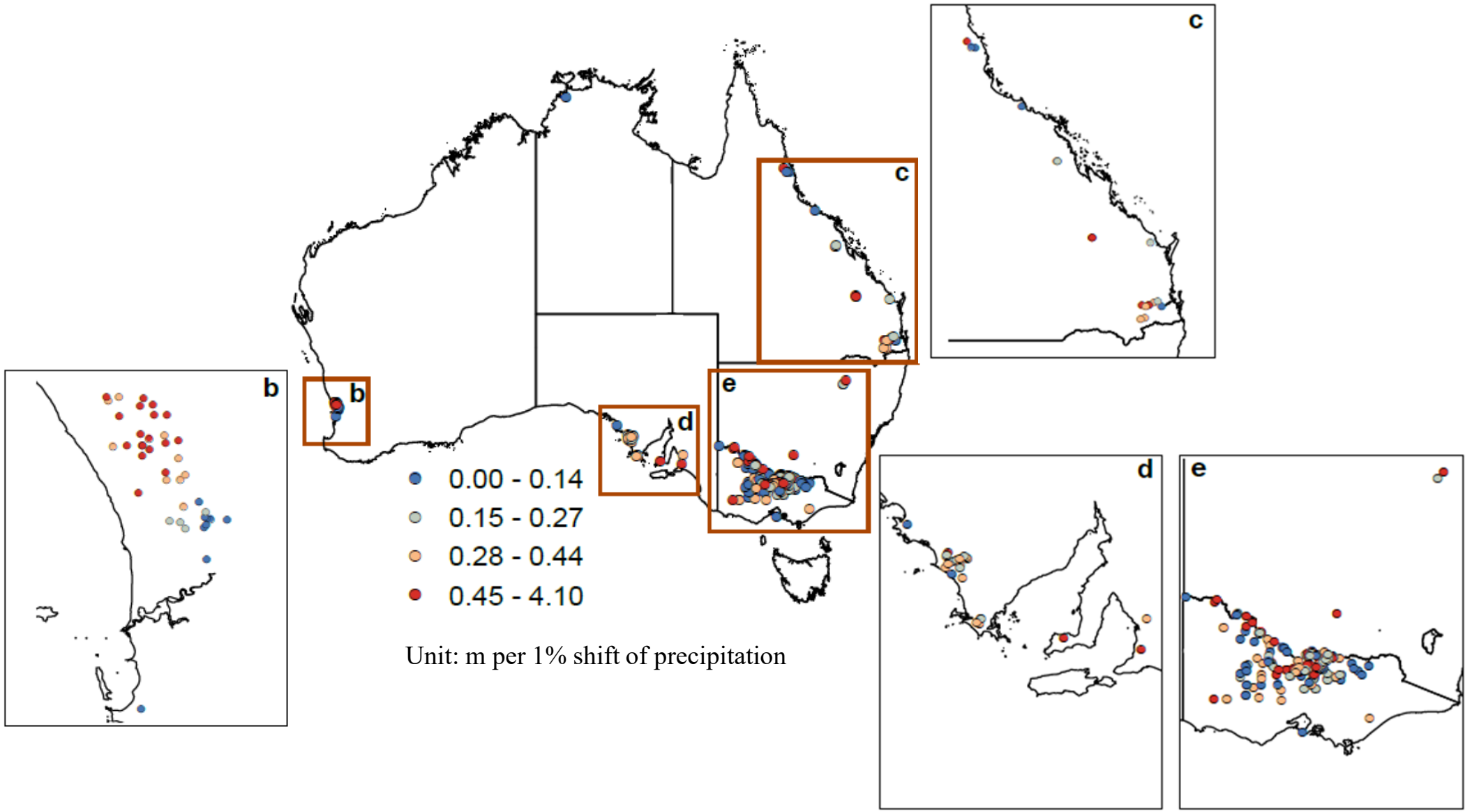
Groundwater level sensitivity to precipitation



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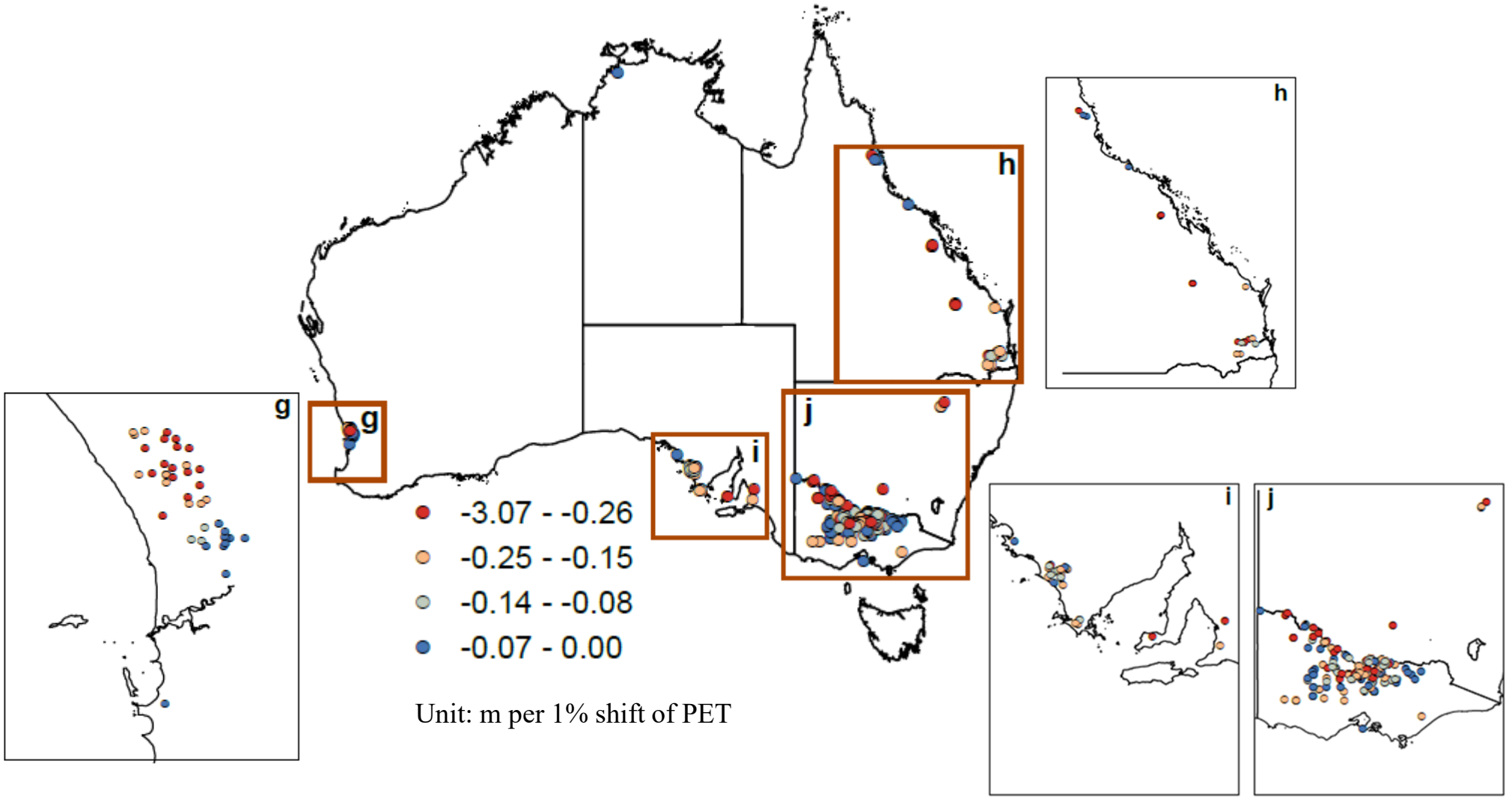
Groundwater level sensitivity to PET



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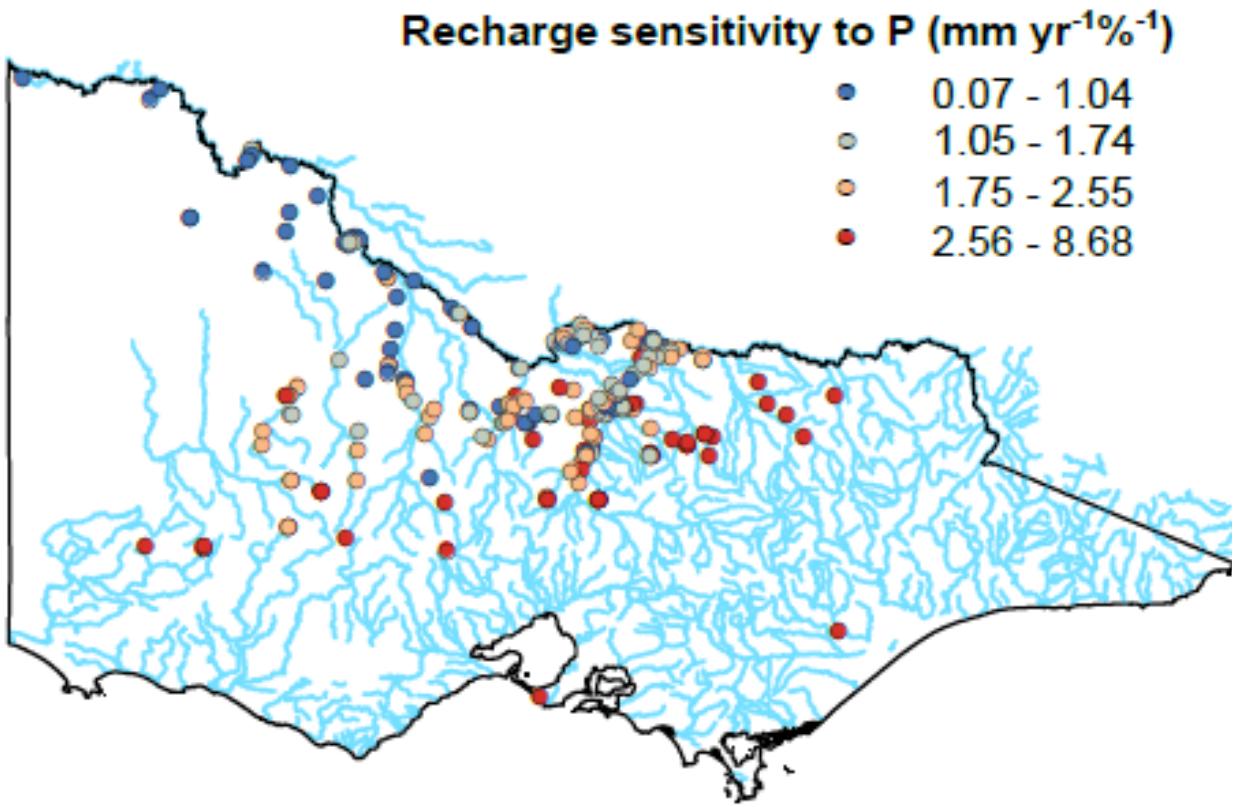
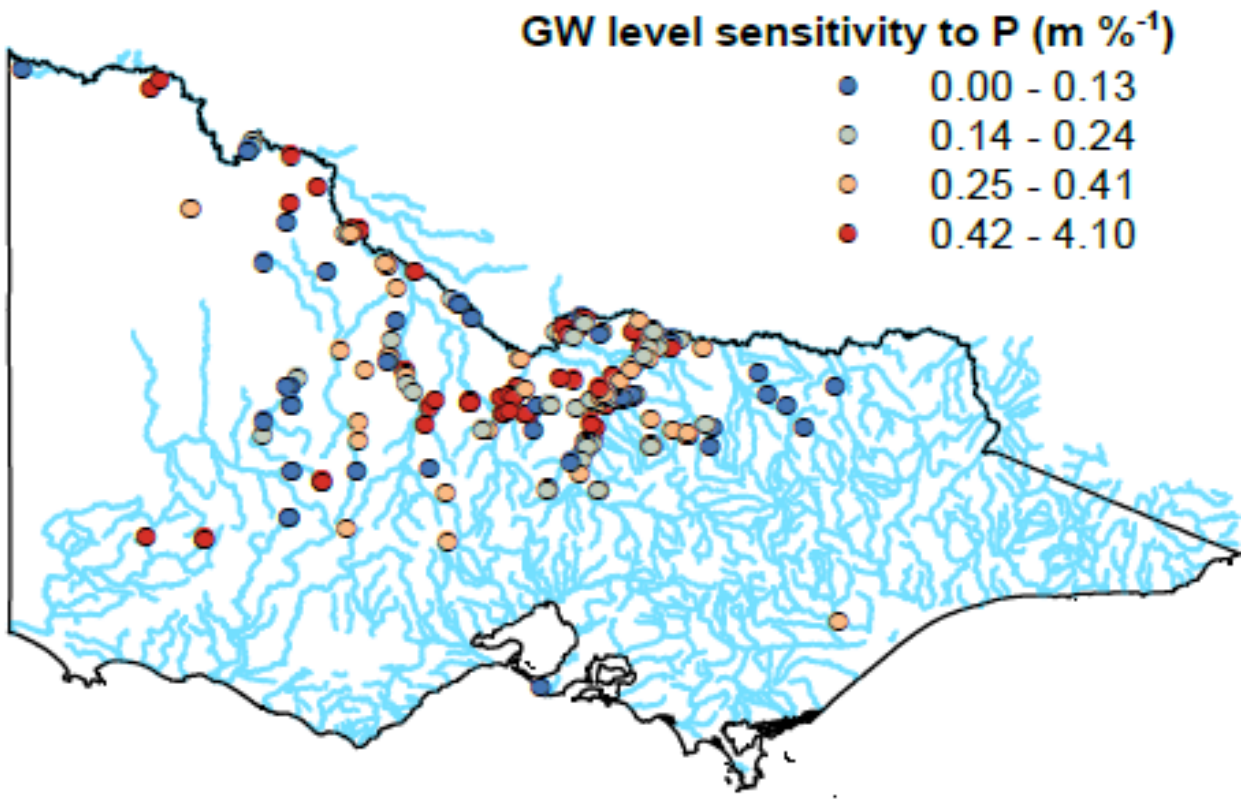
Groundwater level & recharge sensitivity to precipitation





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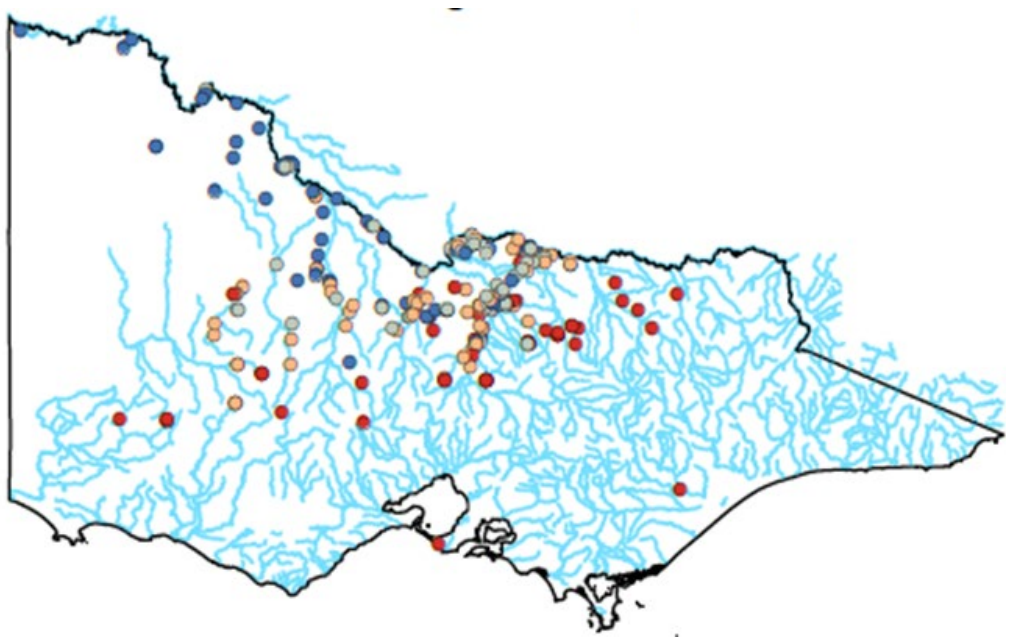
Concluding remarks

- Climate-dominated bores were identified using HydroSight time-series modelling.
- 336 bores (6.6%) were climate-dominated.
- Local sensitivity was estimated using multivariate regression.
- Groundwater and recharge were more sensitive to precipitation than PET.
- Groundwater level sensitivity was more spatially variable than recharge.



Thank you!

Xinyang Fan: xinyangf1@student.unimelb.edu.au
Twitter: @xinyang_fan